

THE BIOLOGIST



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Quaker Run, Allegany State Park.

THE ALLEGANY SCHOOL OF NATURAL HISTORY

By Robert E. Coker, Ph.D., Director Chapel-Hill, N. C.

THE ALLEGANY SCHOOL OF NATURAL HISTORY at Quaker Bridge, N. Y., was established six years ago to provide special opportunities for those who wish to pursue, under guidance or independently, studies of Natural History, terrestrial and aquatic, away from seacoast and lakes. Located in a large area of protected forests and mountain brooks, and convenient to the upper parts of the Allegany River, the institution is well-provided with laboratories and equipment for botanical, zoological and geological studies, as well as with the facilities for comfortable living and effective work, including electric lights and running water. Its campus comprises part of the forest, a lively brook and a small artificial lake several acres in extent. One does not have to go out of sight of a laboratory to be collecting and making observations in the wild, but 65,000 acres of protected State lands surround it, and adjoining these is the still greater area of the Allegheny National Forest.

Allegany State Park forms part of an elevated plateau situated in a broad loop of the Allegheny river, which, after flowing from Pennsylvania into New York, turns back southward to pass again into Pennsylvania. The western boundary of the park area is the Cattaraugus Indian Reservation bordering the river. There for more than a hundred years the Quakers have maintained for the Indians a mission school that gave rise to the name of Quaker Bridge, the post office of the Allegany School.

The Allegany School is nine miles from Quaker Bridge and well above it, being located on a hillside bordering Quaker run in its upper part at an altitude of about 1900 feet. The summer climate is conducive to study as well as to outdoor activity; the nights are cool, and frequently even cold, for frost may occur in the narrow valleys of the park in any month of the year.

It is a notable feature of the setting that, being within an area of some 65,000 acres under care of the State, much of the wild life is protected, and so one may occasionally see in a wild state bear, deer, raccoon and porcupine, besides observing daily the abundant smaller mammals—squirrels, chipmunks, field mice and, less frequently, jumping mice, shrews, weasels, mink and others. There are few places, in fact, where small animals in great variety can be so readily observed and collected.

The forests, commonly dominated by birch, beech, maple and hem-

lock, cover a vegetational carpet of almost tropical appearance, with luxuriant growth of ferns, club mosses and other low-growing plants. Orchids and other flowers thrive in the forests, along the roadsides and in the occasional open meadows. In consequence partly of early lumbering operations and partly of natural conditions, the floor of the woods is strewn with rotting logs and stumps almost continuously moist, and affording favored habitats for salamanders, snails, myriapods and insects.



Field Work, Allegheny School.

The many small streams, the artificial lake at the school, the Allegheny river and some neighboring lagoons offer a variety of habitats for aquatic life.

The region is well situated for a study of many principles of geology. Especially well demonstrated is the work of ground water and running water and continental glaciation. The park area, in a maturely dissected plateau, and the readily accessible glaciated area contain type examples of topographic forms and drainage changes due to the work of water and ice.

Numerous zones of the Upper Devonian and later Palaeozoic rocks are extremely fossiliferous and carry distinctive forms of invertebrates and plants. The Bradford and Warren oil fields near by exemplify methods used in drilling, producing and refining, besides affording op-

portunity to observe the character of the rocks brought to the surface by the drill from hundreds of feet below.

The forests of the park are generally dominated by sugar maple-beech and oak-chestnut or oak-hickory types, with extensive areas of aspen-red maple-cherry, hemlock-birch and stream marginal types. Ferns, club-mosses, bryophytes and fungi occur in great variety and abundance. Cut and burned areas afford excellent opportunities to study successional processes. Meadows, roadsides and woods afford a variety of flowering plants, and natural gardens of aquatic plants are con-



Main Buildings, Allegheny School.

veniently accessible. A restricted area of virgin forest is found in the Allegheny National Forest in Pennsylvania, which adjoins the park. There are about 2000 acres of large beech-maple forests in the Big Basin area of the park.

The numerous small brooks and the dense hardwood forests with a thick carpet of humus and innumerable decaying logs and stumps, that are almost continuously moist, afford an unusual wealth of animal life, including small mammals, salamanders, snails, myriapods and insects of various kinds. The small artificial lake at the school offers a useful type of environment for study, and there are meadows and bogs at no great distance. Within a few miles of the school is the Allegheny river, with hellbenders (*Cryptobranchus*), large mud puppies (*Necturus*) and the nests of both species, and the backwaters of the Tunungwant valley have an abundance of aquatic insects, etc. The location is therefore unusually favorable for many types of ecological study, as well as for special studies of the natural history of particular animals.

The park offers several advantages for the study of birds. The

semimountainous character of the region brings together northern birds, not well-known as summer birds to students farther south or those of lower elevation, such as the hermit thrush and northern species of warblers, and some species more distinctively southern, such as the cardinal, hooded warbler and yellow-breasted chat. The small lake by the school grounds has already proved an attraction to some water birds. Other marshy areas occur near enough to the school to be visited on field trips and to give acquaintance with the birds of such habitats. One hundred sixteen species of birds are now known from the park area in summer.

The school places great emphasis upon study in the field, without neglecting the essential indoor work for which it is well equipped.



The Lake, Allegany School.

The Allegany School draws students from all parts of the country, including teachers, graduate and undergraduate students from colleges and universities, who come either to take regular courses or to engage in biological or geological research, conducted independently or under guidance from the staff. Students live in comfortable cabins, two to a cabin, and the cabins are electrically lighted and provided with means of heating appropriate to the cool summer climate of the region.

The teaching staff is composed of men fully experienced in field work and in teaching in their respective subjects. Each class is with the instructor for a full day each week and for an additional conference hour

later in the week. In addition, each student works out of class independently or with occasional direction for nearly two days. Two courses thus constitute ordinarily a full program, but students may enrol in only one course, if preferred.

This schedule is found by experience to have several advantages. It permits of extended field trips even to distances of 20 miles or more on the school bus, or of visits to several environments when comparisons are desired. It makes it possible to work over the fresh material in the laboratory, even after field trips of several hours' duration. It allows the most appropriate interlocking of lectures, discussions, laboratory and field work. Finally, it eliminates all time lost in going from class to class and reduces to a minimum the waste of time in getting ready for work and in putting things away. There is little occasion for "watching the clock."

The scientific staff for the summer of 1932 consists of Dr. R. E. Coker (Hopkins) of the University of North Carolina, Director of the School and instructor for Zoology; Aretas A. Saunders (Yale) of the Bridgeport, Connecticut, Schools, instructor for ornithology; Dr. Robert B. Gordon (Ohio) of Ohio State University, instructor for Botany; W. P. Alexander (Cornell and Leipzig) of the Museum of Science in Buffalo, instructor for Nature Study; and Frederick T. Thwaites (Wisconsin) of the University of Wisconsin, instructor for Geology.

The school has the approval of the Board of Regents of the New York State Education Department, the officials of the Buffalo Society of Natural Sciences, the Commissioners of the Allegany State Park and the University of Buffalo. The general educational supervision is furnished by Dr. Charles C. Adams, Director of the New York State Museum, who for many years has given special attention to outdoor instruction in natural history.

Students are greatly aided in their studies by a specially prepared series of guide books on the natural history of the region. Dr. A. K. Lobeck has written an illustrated guide to the physical features of the region. Dr. H. D. House and W. P. Alexander have prepared a guide to the flora of the park and Norman Taylor a guide to the plant societies of the park. Dr. S. C. Bishop and W. P. Alexander have written a guide for the study of the reptiles and amphibians of the region. A guide to the birds by Aretas A. Saunders, a member of the staff, and reports on the fishes by Messrs. Kendall, Dence and Hankinson have already been issued by the Roosevelt Wild Life Station at Syracuse. Thus there is an unusual amount of helpful literature on the local natural history.

Registration should be completed before June 1st. Each applicant

should state with his application for registration, his preparation for the chosen work and present any necessary credentials for admission. Only persons who have at least the equivalent of a high school course should apply. No one will be received at the school who has not made arrangements for admission in advance.

A student may register for one or two courses.

Applications will be filed in order of their receipt. A deposit of \$5 is required to complete the application. This is necessary in fairness to all applicants.

The school has accommodations for 50 students and this number will not be exceeded until the facilities are enlarged.



Students' Summer Homes at the Allegany School.

Board is furnished at the camp mess under the supervision of the camp manager, Guy J. Evans. This includes lunches taken on all field trips. Students or staff members are not permitted to cook their own meals. On the day of registration a deposit of \$90 in cash, check or draft is required to cover the expense of board. On August 1st the balance of \$55 is due.

The sixth season extends from July 5 to August 24, 1932. Those wishing reservations or information may apply to the Director of the School, Dr. R. E. Coker, Chapel Hill, N. C., to the Buffalo Society of Natural Sciences in Buffalo, N. Y. or the New York State Museum in Albany, N. Y.



HOPKINS MARINE STATION, PACIFIC GROVE, CALIFORNIA
Jacques Loeb Laboratory in Front, Alexander Agassiz Laboratory in Rear.

HOPKINS MARINE STATION AT PACIFIC GROVE

By Gilbert M. Smith, Ph.D., Stanford University

THE HOPKINS MARINE STATION of Stanford University is located at Pacific Grove, California, on the Monterey Peninsula, 125 miles south of San Francisco. Pacific Grove is the terminus of a branch line from the Southern Pacific's main line between San Francisco and Los Angeles, and holders of round trip tickets from the East may reach it by taking a stopover at Del Monte Junction. A paved highway connects Pacific Grove with the main automobile road between San Francisco and Los Angeles.

There are two reinforced concrete buildings at the Station, the Alexander Agassiz Laboratory and the Jacques Loeb Laboratory. The Agassiz Laboratory is 80 x 40 feet and has three stories. The ground floor provides an aquarium, store room, photographic dark room, and two small research rooms. The second floor has three general laboratories and two private laboratories for instructors. The third floor contains a library, an advanced laboratory, and six private laboratories for investigators. Fresh and salt water are provided. The Loeb Laboratory consists of a two-story central portion with two flanking wings of one story, and covers an area 85 x 152 feet. The eastern half of the first floor consists of a general laboratory, three advanced laboratories, four private rooms, two storerooms, and an office. The western half comprises a chemistry laboratory, two other large rooms for special work, a thermostat room, a balance room, three special apparatus rooms, three small dark laboratories, and a photographic dark room. The principal laboratories and work rooms are provided with outlets for sea water, hot and cold fresh water, distilled water, gas, alternating and direct current, compressed air, and vacuum. The second story consists of two stack rooms, a reading room, and two private rooms.

Pacific Grove was selected as the site of the station after a careful biological examination of several sites along the California coast. The extraordinarily rich fauna and flora of the Monterey Bay region offers exceptional opportunity to the investigator and beginning student alike. A good automobile road parallels the shore line of the entire Peninsula and makes every portion of the shore available to the collector. It also

makes possible the study of material in the laboratory within a few minutes after collection.

The richness of the fauna and flora is in part due to the diversity of environment, which ranges from a rugged granite coast, broken by beaches, to sheltered estuaries alive with mud-loving species. The groups which especially give character to the fauna are the coelenterates, polyclads, nemerteans, bryozoans, echinoderms, chitons, gastropods, polychaets, the higher crustacea, and the tunicates. Among the actinians, *Eractis*, *Epiactis*, *Urticina*, and *Corynactis* are the high lights. The solitary coral, *Balanophyllia*, is abundant. There are about ninety species of hydroids. Siphonophores and ctenophores are occasionally common but of uncertain occurrence. There are upward of fifty species of chitons, the largest, *Cryptochiton stelleri*, reaching a length of 12-15 inches. The large abalone, *Haliotis*, is the outstanding mollusc of the coast. Dorid nudibranchs are conspicuous for their size and brilliant coloring. The bay teems with squid in spring and summer and octopus, which is common but not easy to procure, reaches a weight of 40 pounds. Among the polychaets are numerous representatives of *Halosydna*, *Polynoe*, *Nereis*, *Leodice*, *Lumbrinereis*, *Glycera*, and *Amphitrite*. A showy sabellid, *Eudistylia*, is abundant, while every rock-pool is alive with serpulids. *Arenicola* is less easily procured. Conditions appear to be ideal for flat-worms and nemerteans. Bryozoa, especially the encrusting forms, are conspicuous and compete for available surface with sponges and very thrifty ascidians. Among the crustacea the crabs are most conspicuous, but of more interest are the primitive burrowing shrimps, *Callinassa* and *Upogebia*. *Emerita* is abundant, as are also pagurids and several mysids. Barnacles of several species are very abundant, on the granite, and of course swarms of isopods and amphipods.

For experimental biology an abundance of sea urchins (*Strongylocentrotus purpuratus* and *franciscanus*) is available. The sea star, *Patiria minuta*, is equally good. *Leptasterias aequalis* and *Henricia levinsculi* brood their eggs. The same is true of the small holothurians, *Cucumaria curata* and *Thyonopsis nutrens*. A big echiuroid, *Urechis caupo*, is an almost perfect type for experimentation, and its large clear eggs can be procured without injury to the animal. The alga *Halicystis ovalis*, widely used in studies on permeability, is available in limited quantity.

The algal flora is rich, and many of the species are to be found in the zone exposed by the tides. The most striking of the algae are the giant

kelps, among which *Macrocystis*, *Nereocystis*, and *Postelsia* occur in abundance. Other brown algae of particular interest are *Pelvetiopsis* and *Hesperophycus*. The green algae are well represented and there are several of the Siphonales that are usually found in a fruiting condition during the summer. The marine blue-green algae are not particularly abundant, but the red algae are present in wide variety and include many of the genera that are peculiar to the Pacific Coast.

The Station is open during the entire year, and maintains a permanent staff of resident investigators and technical assistants. Graduate and undergraduate courses are offered during the Spring and Summer Quarters. During these Quarters the staff is augmented by professors from the campus at Palo Alto, and by the appointment of visiting professors. The research program of the Station centers around the field of oceanic biology. This work includes a hydrobiological survey of Monterey Bay in co-operation with the State Fish and Game Commission. Other investigations in progress include a spectroscopic and chemical study of bacterial and algal pigments; and a study of photosynthetic bacteria.

The resident members of the staff are: W. K. Fisher, Director and Professor of Zoology; Harold Heath, Professor of Zoology; Tage Skogsberg, Associate Professor of Marine Biology and Oceanography; C. B. van Niel, Associate Professor of Microbiology; G. E. MacGinitie, Assistant Professor of Zoology and Assistant to the Director; Harold Mestre, Assistant Professor of Biophysics. Other members of the staff for the coming summer are F. E. Fritsch (University of London), Acting Professor of Botany; A. R. Moore (University of Oregon), Lecturer in General Physiology. The following members of the Stanford faculty will be on the Station staff this summer: C. V. Taylor, Professor of Biology and Associate Director; G. M. Smith, Professor of Botany; D. M. Whitaker, Associate Professor of Biology.

Courses offered this summer are: Marine Zoology (MacGinitie); Marine Invertebrates I (Fisher); Marine Invertebrates II (Skogsberg); Shore Ecology (MacGinitie); Vertebrate Embryology (Heath); Experimental Embryology (Whitaker); The Algae (Fritsch and Smith); Physiology of Marine Plants (Mestre); Physico-chemical Biology (Mestre); General Microbiology (van Niel); Research (Staff).

Enrollment in all classes is limited and all candidates for admission to classes should apply to the Director, Hopkins Marine Station, Pacific Grove. Independent investigators expecting to work at the Station this

coming summer are also requested to correspond with the Director, if they wish to be assured of accommodations.

The Station has no dormitory or mess accominodations, but room and board may be obtained at reasonable rates in Pacific Grove, and within walking distance of the laboratories. Prospective visitors to the Station should be provided with warm clothing because the weather is often cold and foggy during the summer.

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THE UNIVERSITY OF MICHIGAN BIOLOGICAL STATION

By George R. La Rue, Director, University of Michigan

THE UNIVERSITY OF MICHIGAN BIOLOGICAL STATION had its origin in 1909 when Professor Jacob Reighard, now Professor Emeritus of Zoology in the University of Michigan, and Professor George Burns, now Professor of Botany in the University of Vermont, became interested in making an intensive study of the animals and plants of Michigan in their natural surroundings. It was desirable to establish a station within a region as little disturbed by man as possible and at the same time readily accessible for the transportation of supplies and equipment.

During the twenty-three consecutive years of its existence the Biological Station as a physical plant has grown from a few tents and one log cabin to 125 buildings of wood, concrete and steel construction. The faculty has been increased from two to fifteen members and the student body from 13 to 108 students in 1931. The membership of the Station including students, faculty, investigators, and the various staff members and families now numbers more than 190 people.

The Station is situated on the shores of Douglas Lake on the tip of the Lower Peninsula of Michigan and is almost equidistant from Cheboygan, Mackinaw City and Petoskey. It is located on the Bogardus Tract, an area of nearly 4,000 acres of land which extends from Douglas Lake to Burt Lake on the south, and has a combined frontage on the two lakes of more than six miles. The Bogardus Tract is the property of the University of Michigan and is occupied exclusively by, and devoted to, the Biological Station. Except for two small summer resorts on Douglas Lake, the region for miles about is almost uninhabited.

The Douglas Lake region is peculiarly well adapted for biological studies. This part of Michigan is diversified by hills and valleys, and was formerly covered by virgin forests of hardwoods and conifers. Small tracts of the former remain. Over most of the area second growth forests are becoming well established. The region contains many lakes of clear water, unsurpassed in the State for size, depth, and beauty of setting. Douglas Lake is of irregular outline, two and one-half miles wide and four miles long. Its wooded shores are in some places low and receding; in others they rise in terraced bluffs seventy feet high. The beach is of

clean sand or stony, and the lake bottom, except for occasional abrupt drops, slopes gradually into deep water. This great variety of conditions ranging through a complete series of situations from lakes to hills and located in the transitional zone supports a large number of species of plants. For these reasons, also, the region is equally well supplied with a varied animal population, being particularly rich in its invertebrate fauna.

The Station is located on a narrow strip of level ground along the south shore of the east end of Douglas Lake. The plan consists of two



Group of Laboratories and Portion of South Fishtail Bay.

streets paralleling the shore and connected by cross streets. There are three main divisions of the Station, the central portion or campus, the west end or residence areas for men and married students, and the east end or residence areas for women students, faculty, other staff members, investigators and health service. The entire Station is adequately supplied with a sanitary system and a water system. The campus and the west residential area are equipped with electric lights and it is hoped that in the near future the lighting system can be extended to the east residential areas as well.

The residence cottages are of two types, wood-sheathed with metal covering, or wood-sheathed and covered with slate-surfaced roofing felt. All have concrete floors, screened windows, screened doors, and stoves. They are equipped with beds, tables, chairs, and other necessary furniture. The cottages occupied by the men and married students are of the

wood and metal type, 14 x 14 feet square in floor dimensions, and equipped with electric lights. All other cottages have the slate-surfaced roofing felt covering. Those occupied by the women students and the investigators are 14 x 16 feet, and those occupied by the faculty families are 14 x 34 feet in floor dimensions.

On the campus proper are located the buildings used in common by all members of the Station. The largest of these is a two-story administration building of steel and concrete construction, housing the administration offices, photographic rooms, stock rooms, store, post-office and kitchen storage below, and a kitchen and dining room above. There are nine laboratory buildings housing 13 laboratories, a library, an aquarium, an insectary, an animal house, a club house, shop, tool room, garage, and keeper's house. Near the campus to the east are the hospital, physician's residence and office, and to the west a boathouse with a covered harbor.

The Station is adequately equipped to care for the demands of students and investigators. For transportation of classes and supplies the Station owns three trucks, several launches, outboard motors and row-boats. Other equipment for class use includes nets, seines, traps, cameras, field glasses, microscopes and accessories, microtomes, aquaria, pens, cages, a large supply of minor equipment and a good working library. The zoological laboratories have large collections of bird skins, mammal skins and skulls, and many preserved specimens of reptiles, amphibians, fish and parasite worms. The herbarium includes nearly all of the flowering plants of the region.

Class work is conducted in six courses in botany and seven courses in zoology, and in addition many students and faculty members are engaged in special problems of investigation in both botany and zoology.

The botanical faculty consists of four members: Dr. John H. Ehlers, assistant professor of botany, in charge of systematic botany, Dr. Carl D. La Rue, assistant professor of botany, in charge of work in plant anatomy, both from the University of Michigan; Dr. Frank C. Gates, professor of botany in Kansas State College, in charge of work in plant ecology, Dr. George E. Nichols, professor of botany in Yale University, in charge of the work in lower plants.

The zoological faculty is made up of eight members whose fields of interest follow their names. From the University of Michigan are: Dr. George R. La Rue, professor of zoology, Director of the Station, animal parasitology; Dr. Paul S. Welch, professor of zoology, limnology; Dr. Frank N. Blanchard, assistant professor of zoology, ornithology; and Dr. Frank E. Eggleton, assistant professor in zoology, limnological

methods. Those from other universities are: Dr. Herbert B. Hungerford, professor of entomology in the University of Kansas, entomology; Dr. William W. Cort, professor of helminthology in Johns Hopkins University, parasitic worms; Dr. Charles W. Creaser, associate professor of zoology in the College of the City of Detroit, mammals, reptiles, amphibians, fish; and Dr. Lyell J. Thomas, assistant professor of zoology in the University of Illinois, working with Professors La Rue and Cort in helminthology.



Dining Hall.

Other members of the staff are Alfred H. Stockard, instructor in zoology in the University of Michigan, Secretary of the Station; Jewel F. Stockard, dean of women; and Dr. Nelson M. Smith, physician at the Health Service in the University of Michigan, Station Physician.

With a teaching staff composed of men of recognized authority in their fields and drawn from several leading universities, the Station is given the advantages both of excellent teaching and direction of research, and of broader contacts with scientific spirit and progress over the country than could be had from a staff drawn from any one university. The coming together each summer of the staff from the several parts of the country brings something of the spirit of a scientific meeting in that thought and discussion for the entire summer are centered on the various phases of biology.

The courses taught at the Biological Station deal with those phases of biology which can best be learned by close contact with the undisturbed plants and animals in their natural habitats; or by the study of those plants and animals in the laboratory in relation to their natural habits and habitats. All courses essentially systematic in nature, as sys-

tematic botany of the flowering plants, ferns, mosses and algae, entomology, ichthyology, herpetology, ornithology and mammalogy, as well as plant anatomy, are conducted with considerable emphasis placed on living appearances, habitats, and natural histories of these forms. The Station is particularly suitable for the ecological studies—plant ecology, limnology and parasitology.

The student population of the Biological Station is an inspiring study within itself. Of the 108 students enrolled in 1931, eighty-five, or 79%, were graduate students, and twenty-three were undergraduates. Thirty-seven of them, or one third, claimed Michigan as their home state. Of the remaining seventy-one, fifteen came from Illinois, eight from Ohio, eight from Pennsylvania, five from Minnesota, four each from Indiana, Iowa, New York, and Wisconsin, two each from Connecticut, Oklahoma, and West Virginia, one each from California, Colorado, Georgia, Kansas, Massachusetts, Kentucky, Mississippi, Missouri, North Carolina, Tennessee, Texas, Utah, and China.

While the large number of out-of-state students at the Biological Station entails considerable additional expense to the State of Michigan, the contributions of these students are worthy of consideration. In the same way that the faculty members from various parts of the country bring contacts and ideas of the progress of the country with them, the students make the Station a cosmopolitan institution. Many of the graduate students as well as the faculty and visiting investigators, both while here and back at their winter residences, are engaged in working out problems concerning animals and plants of this part of Michigan, and as a result the biological situation of the Douglas Lake region is, perhaps, better known than that of any other region in North America, excepting that of Woods Hole.

Many productive botanical investigations are being carried out at the Station. The situation and equipment are best adapted to work in plant ecology, taxonomy, and physiological and ecological anatomy, and many contributions in these phases of the subject have been produced. During the summer of 1931 twelve investigators were working in botany and with very encouraging results.

Because of its large variety of plant habitats the Douglas Lake region is particularly suitable for work in fresh-water algae and bryophytes. Over one hundred genera with 450 species of algae and 282 species of bryophytes are found there. Of these bryophytes 115 have not been recorded from other parts of Michigan.

With the great variety of habitats, the richness of the plant life and

the abundance of ecologically related invertebrate fauna always on hand, work of an ecological nature is pursued to excellent advantage. These conditions also provide an abundance of material for investigation, both in the laboratory and in the field, in ecological and physiological anatomy.

General entomology receives a good share of the attention of investigators. Contributions from the Station in this field have been numerous, and the solution of each problem unearths new problems for solution. During the summer of 1931 five investigators were engaged in research in entomology.



Health Service Buildings.

The opportunities for investigations in limnology are very favorable. Last summer eight people at the Station pursued problems in this field, five in general limnology and three in aquatic entomology. The limnological situation and equipment are quite adequate for the determination of life-histories and ecological relationships.

Researches in parasitology have been particularly productive, and last season fourteen people were carrying on investigations in parasitology. The subjects under investigation by this group were quite varied. The largest number on any one phase of the subject were engaged in the life cycles of the digenetic trematodes, including studies on the further development of holostome, schistosome and stylet cercariae. Another group was studying the life cycles of tetraphyllidean cestodes. Other problems on the helminths are concerned with cestode and nematode morphology and with the life cycles of several nematodes in aquatic hosts. An interesting investigation on a blood-inhabiting protozoon, *Leucocytozoon*, brought worth-while results. Life history studies seem to be best suited to the location and equipment of the Biological Station.

The life cycles of a considerable number of parasitic forms have already been worked out and others are in the process of solution.

Attendance at the Station is a distinct advantage to the student. Students are constantly searching for appropriate problems for investigation, and many problems are being discovered at the Station as the biological situation there is more and more completely analyzed. The teachers of biology in public schools are finding the Station to be a particularly valuable source of training for their work. A first hand knowledge of a large number of living things, both plant and animal, in their natural habitats and under normal conditions is of prime importance for doing the type of teaching required in modern public schools. The usual college courses in biological subjects do not give this type of training. Two or three summers of attendance at the Biological Station give the desired training and stimulate an invaluable enthusiasm for biological work.

While the predominating spirit of the Station is one of work, the social side of life is by no means neglected. The entire Station population is brought together for meals in the large dining hall. Positions are reassigned by chance once each week so that the student population is constantly being shifted and new acquaintances are being formed. With the excellent water and an ideal sand beach and lake bottom, swimming is an attraction in the late afternoon. On the Fourth of July the annual picnic is held on top of a large hill overlooking the Station and lake. Here games and contests of various sorts are held, followed by a picnic supper, an initiation parade for new students and a party or dance in the clubhouse in the evening.

On each Saturday night of the session an entertainment of some sort is given at the clubhouse. Bridge, stunt parties, "dress-up" parties, community singing, and dancing all have their turns. These attractions are very popular with the entire Station population, the only problem being that of room to accommodate the attendance.

During the summer several Sunday excursions are conducted to various points of interest. Each summer a group journeys by launch over the once-famed Inland Water Route starting at Conway and passing through Crooked Lake, Crooked River, Burt Lake, Indian River, and Mullet Lake to Topinabee, and return. Another annual excursion visits historic Mackinac Island and Less Cheneaux Islands in Lake Huron. Each season a photographic exhibit offers opportunity for the display of pictures of general interest taken by members of the Station, and for the exchange or purchase of prints.

Perhaps the feature event of the summer is the annual Visitors Day. On this date the Station holds open house for the benefit of any visitors who wish to become acquainted with the Station and its work. Buildings and laboratories are thrown open and samples of class work and research are placed on display with qualified exhibitors to explain or demonstrate each exhibit. This has come to be an interesting and enlightening attraction for people in this portion of the State, and the types of work are so varied and the number of workers is so great that, indeed, the members of the Station look upon this day as an opportunity to make themselves acquainted with the work done at the Station.



Group of Laboratories and Portion of South Fishtail Bay.

Try These Examination Questions

Mention all the names of places in the world derived from Julius Caesar or Augustus Caesar.

* * * * *

Where are the following rivers: Pisuerger, Sakaria, Guadalete, Jalon, Mulde?

* * * * *

Tell all you know of the following: Machacha, Pillmo, Schebulos, Crivoscia, Basecs, Mancikert, Taxhen, Citeaux, Meloria, Zutphen.

* * * * *

Name the length and breadth of the streams of lava which issued from the Skaptar Jokul in the eruption of 1783.

—From Mark Twain's "English as She is Instructed."

THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY

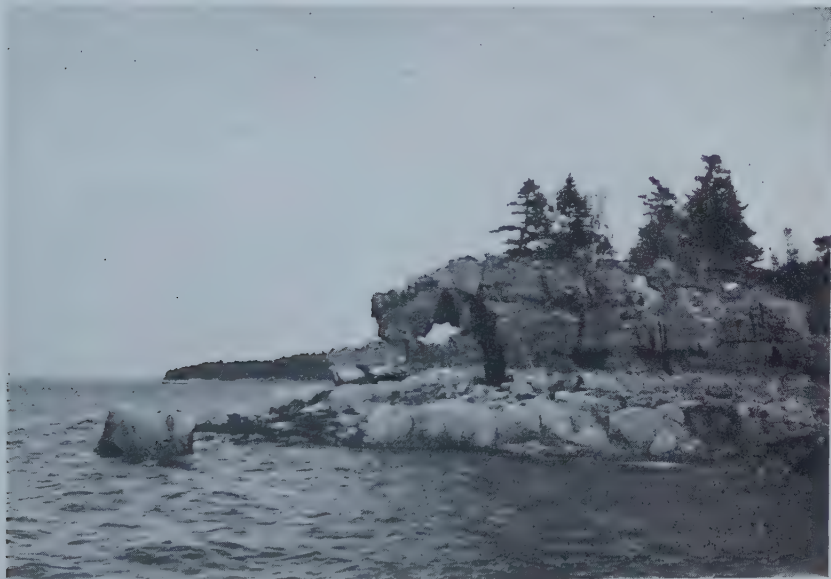
By William Harder Cole, Ph.D., Director Rutgers University, New Brunswick, N. J.

MOUNT DESERT ISLAND is situated on the coast of Maine, one hundred miles east of Portland. Its cold waters are extraordinarily rich in marine life, including forms found on rocky, surf-beaten shores, in muddy coves, on the sea bottom at a multitude of depths and conditions, and floating on the surface of bays, inlets, and open sea. Depths of over a hundred fathoms are found within twenty miles, where hundreds of pelagic forms are found on the surface in their season. The deep bottoms furnish brachiopods, huge actinians, basket stars, tunicates and other rare forms. Mud flats furnish a great abundance of invertebrates and plants. The tide rises and falls from twelve to fourteen feet, giving ample opportunity to secure many forms on the bottom or in rock pools, while the strong currents from the outer sea bring in many jelly-fishes and floating species not ordinarily easy to secure in still waters.

In the following list are mentioned some of the common aquatic animals which may be secured at Mount Desert Island for investigation during the summer season.

1. Many different types of bryozoa and rotifers—very abundant.
2. The actinian, *Metridium*—abundant; breeds irregularly in summer.
3. Several balanoid barnacles at their best—extremely abundant.
4. The nemertean, *Cerebratulatus lacteus*—can be secured in small quantities with ripe eggs from July to August 20th.
5. The sipunculid worm, *Echiurus Pallasi*—regularly available in moderate numbers; sometimes ripe with eggs or sperms.
6. The brachiopod, *Terebratulina*—very abundant.
7. The mud starfish, *Otenodiscus*—very abundant; breeds in winter.
8. The many armed starfish, *Crossaster* and *Solaster*—available in moderate numbers; breed in winter.
9. The sand dollar, *Echinarachnius parma*—abundant. Eggs and sperm ripe from June to October. Very fine clear eggs with total cleavage.
10. The holothurian, *Cucumaria frondosa*—very abundant; breeds in winter.
11. The tunicate, *Boltenia*—very abundant.
12. The fresh water fishes, *Holopedium* and *Leptodora*—very abundant in the lakes.
13. The marine fishes: the cyclostome, *Myxine*, or slime eel, very abundant; *Fundulus heteroclitus*, abundant, with eggs ripe from July 1st to August 20th; *Lophius*, or goose fish, easily obtainable; cod; haddock; sculpins; flounder (*Pseudopleuro nectes*); and hake, all very abundant. Eggs of hake available in summer.

Upon a survey of the fauna it becomes evident that a research laboratory, situated at some point on the gulf of Maine, is highly desirable for the biologists of the country. Cape Cod, as has been pointed out in past years by Gould, Dana, Verrill, Packard and many others, is the dividing boundary between the more northern Acadian, and the southerly Virginian fauna and flora of our coast, and no other boundary is so sharp in its delimiting of many species and genera. The Marine Biological Labora-



The Maine Shore Line, Mt. Desert Laboratory

tory at Woods Hole serves as a point of access to the Virginian fauna and the Mount Desert Island Laboratory brings the worker in contact with the rich Acadian groups.

In addition to its marine fauna, the island, which comprises about one hundred square miles, has a range of bold, deeply divided, ice-eroded mountains that form a belt across its southern half. Their lower sides are clothed by forests, and between their peaks, rising at the highest to over 1500 feet, are lakes, streams, and marshes with a rich fresh-water fauna and flora. Several of the lakes are large and deep; one of lesser size is 1100 feet above the sea. Brooks of cold water are abundant, containing trout and a great variety of northern fresh-water invertebrates. Besides being the home of numerous plant and animal communities, the island is on the migration route of many birds.

Situated in a region of great beauty, unspoiled by commercial exploitation or nearness to cities, the laboratory has the advantage of being placed near the wild life sanctuary of the Acadia National Park. This is the only national park in the eastern portion of the continent and the only one in the country in direct contact with the sea. This secures for all time a permanent and singularly rich area for biological study.

Salisbury Cove is an old fishing and farming hamlet on the north shore of Mount Desert Island, about five miles from the town of Bar Harbor and on the main road from it to the town of Ellsworth on the mainland, where there is a railroad station and an important railroad junction. The village of Salisbury Cove is a market-gardening and farming community of a quiet and simple kind, but Bar Harbor has good stores of every sort, an excellent hospital, express, telegraph, cable facilities, bus and boat service.

The Weir Mitchell Station offers no instruction, but provides facilities for research in marine biology. The buildings are served with running fresh water and running sea-water from a non-toxic system, in which the running salt water touches only a lead pump, lead pipe, a wooden tank and glass. Each research room is supplied with electricity for light, heat, and power of 110 volts 60 cycles single phase current, and with the equipment and reagents required for ordinary experimental work.

For collecting and dredging in deep water, a thirty-foot boat, the Dahlgren, has been equipped with a four-cylinder Scripps gasoline engine, and the necessary hauling, towing and dredging apparatus. For work nearer shore, a strong sea-worthy gasoline boat, the Porter, and several row boats with proper equipment are available.

Those wishing to come to the Laboratory by rail may arrive from Boston, New York, Philadelphia, or Washington on the Bar Harbor Express over the Boston and Maine Railroad, which will bring them directly to Ellsworth whence a bus runs to Bar Harbor. The connections by water from Boston are excellent and less expensive, the Boston and Bangor Steamship Line leaving Boston every evening and connecting at Rockland in the early morning with a Bar Harbor boat which arrives at Bar Harbor about noon. An airplane line from Boston to Bangor provides rapid service between the two cities at no greater expense than by rail. Prices of fares, staterooms, etc., time of departure and arrivals may be obtained from travel bureaus. Through automobile roads from all sections of New England to Bar Harbor are excellent, with ample facilities for overnight stops. The Laboratory car will meet all arrivals in Bar Harbor, provided notice is received by the Director in advance.

Correspondents are advised against addressing mail to Mount Desert, which is the official name of Somesville, a town on Mount Desert Island.

Applications for use of the laboratory facilities by investigators will be considered on April 15th, and assignments of rooms made according to order of receipt and special needs. Applications received after that date may have to be denied due to limited space. The fee for the use of a research room including ordinary glassware, chemicals and supplies is \$100, for the season, payable July 1st. Microscopes are not available at the laboratory.



The Dining Hall, Mt. Desert Laboratory

Board for those connected with the Laboratory and their immediate families will be provided in the Laboratory dining hall in Salisbury Cove at \$10.00 per week. For others the charge will be \$15.00.

Rooms may be found in the neighboring village at reasonable prices, and for those who wish, lodging will be provided on the Laboratory grounds in army tents on wooden bases at \$2.00 per week per person, two persons in a tent. All bills will be presented at the end of each week.

Applications for research rooms in the Weir Mitchell Station for the season of 1932 should be addressed to Dr. William H. Cole, Rutgers University, New Brunswick, New Jersey, on the blank form accompanying this bulletin. (From June 1 to September 15, 1932, Mt. Desert Island Biological Laboratory, Salisbury Cove, Maine.)

UNIVERSITY OF WASHINGTON OCEANOGRAPHICAL LABORATORIES

By Lyman D. Phifer

A MOST promising field for the study of the many branches of oceanography is found on the north Pacific Coast. It lies in northwestern Washington's "Puget Sound Basin", extending westward to the Pacific Ocean and northward to the Bering Sea and the Arctic Ocean. This vast region is unparalleled for providing an abundance of varied environmental conditions together with a multiplicity of biological forms for oceanographic problems, other than those associated with the subtropics and the tropics.

The arm of the Pacific, reaching down from the northwest for over a hundred miles thru the "Puget Sound Basin" and its numerous islands, forms a sheltered inland water surrounded on shore by geologic formations which yield numerous variations in the transition from terrain to the sea floor. Here one finds wide differences in contour of bottom, outline of shore, sediment, temperature of water, chlorinity, tidal currents, circulations of water bodies, abundance of neritic zoo—and phytoplankton, and shore fauna and flora.

Passing out of this region thru the Strait of Juan de Fuca to the west is the transition from inshore to oceanic water; only a short distance offshore is the continental shelf where there is an upwelling of deep water along the whole western border of the continent. To the north is the island-fringed coast line of British Columbia and the southeastern Alaskan shore, the sunken river mouths forming deep fjords to be explored for the distribution of living forms and the chemical and physical conditions of their environment. To the northwest is the Gulf of Alaska with its great fisheries, and that volcanic chain of islands, the Aleutians, which separate the Gulf from the Bering Sea and the Arctic Ocean to the north.

In all this great area little oceanographic research has been carried on. The knowledge of the region consists of the data from the study of the halibut fisheries by the International Fisheries Commission of Canada and the United States, under the direction of Dr. W. F. Thompson; of studies of other commercial fisheries by the Biological Board of Canada

at its station at Nanaimo, B. C. and its field laboratory at Prince Rupert, B. C.; of results from a few explorations, such as the Harriman Expedition and the Kelp Expedition of the U. S. Bureau of Soils; and for a large part, of the lore of the men who struggle here to extract a livelihood from nature.

Early in Dr. L. M. Spencer's presidency of the University of Washington came his vision of the latent possibilities for the development of marine investigations in the North Pacific. Accordingly in March 1930 the Board of Regents of the University created the Oceanographic Laboratories for research in oceanography, with main laboratories in Seattle and field laboratories in the San Juan Islands near



Laboratory on Seattle Campus, U. of Washington Oceanographic

Friday Harbor. The laboratory on the University campus is the base for operation; at Friday Harbor research and instruction of graduate students are carried on during a nine week summer session, which offers excellent opportunities for first hand contact with field conditions in the littoral and sublittoral zones.

Dr. Thomas G. Thompson of the Chemistry Department of the University of Washington was appointed Director of the Laboratories, and during the summer of 1930 he visited many marine laboratories on both sides of the Atlantic, studying their personnel, plants and equipment, prior to launching the oceanographic program here. He returned home in September wholeheartedly enthusiastic about our region with its diverse conditions and its proximity to the sea.

The permanent scientific staff of the laboratories is composed of the following University of Washington men whose special interests lie in oceanography:

Thomas G. Thompson, Director, Professor of Chemistry—Oceanographic Chemistry.

Lyman D. Phifer, Assistant Director—Phytoplankton.

John E. Guberlet, Professor of Zoology—Parasitology and Embryology.

Robert C. Miller, Associate Professor of Zoology—Taxonomy, Physiology, and Distribution of Marine Organisms.

George B. Rigg, Professor of Botany—Marine Plant Physiology.

Rex J. Robinson, Instructor in Chemistry—Oceanographic Chemistry.

Clinton C. Utterback, Associate Professor of Physics—Physical Oceanography.

By his persistent effort, Dr. Spencer has of late been successful in securing financial assistance from the Rockefeller Foundation. The gift included \$200,000 for the building and equipment of the laboratory at Seattle, \$45,000 for the building and equipping of a research boat, and \$5,000 a year for four years for the maintenance and operation of the boat. To match this gift the state appropriated \$50,000 for scientific equipment, and \$10,000 for the enrichment of the library in those sciences pertaining especially to oceanography.

The Seattle laboratory and its pier are on the University campus, facing south on the Lake Washington Ship Canal at its entrance to Portage Bay. A few minutes run from them are the government locks at Ballard thru which one enters salt water. Construction was begun early last fall and the corner stone laid with simple ceremonies during the winter. With final completion nearly at hand the formal dedication will take place June fifteenth, just before the meetings of the Pacific Division of the American Association for the Advancement of Science, at Pullman, Washington. The principal address will be read by the noted physicist, Dr. Robert A. Millikan.

The new building is a three-story, Gothic, brick structure, sixty-one by one hundred and forty feet. The corridors run around the outer wall, while the rooms are in the center, serviced from a central well carrying the power, pipe, and vent lines. This unusual arrangement is definitely advantageous in several respects: the installation of the utilities is much more economical; the fluctuations in temperature in the rooms are lessened since they are not in contact with the outside walls; the

artificial illumination of many of the rooms may be varied to suit the needs of the workers; and freedom from annoyance by disturbing occurrences external to the building is greatly increased.

On the first and ground floor are the physical laboratories, tanks for storage of sea water, stock room, receiving room, rooms for storage of special apparatus, battery room, mechanical equipment for servicing the building and circulating the sea water system.

On the second floor are the general and micro-chemical routine laboratories, a large botanical laboratory, stockroom for chemical and biological supplies, seven private research laboratories, and the director's offices.



Dining Hall at Friday Harbor Laboratories, U. of Washington Oceanographic

On the third floor are the general zoological laboratories, library and chart room, publications office, seminar room, two photographic dark-rooms, and ten private research laboratories, eight of which are equipped with aquaria and circulating sea water.

The building is supplied with electric outlets for direct current at 110 volts and other variable voltages, and alternating current at 110 and 220 volts for power and lighting. Distilled water is distributed in block tin pipe to central locations. Generally, the rooms are fitted with electric outlets, gas, compressed air, hot and cold water, circulating sea water, and fume hoods in those laboratories where they are needed.

Although the building is not situated on the seashore, running sea water is available. It is brought in on scows and pumped into the two

storage tanks, of concrete surfaced with paraffin, and holding twenty thousand gallons each. From these tanks the sea water is picked up by centrifugal pumps and forced to the tower of the building into a thousand gallon insulated steel, hard rubber lined pressure tank. Here the water is cooled by refrigeration coils to the average temperature of sea water in this region. It then flows by gravity down thru the various aquaria, which are built of soapstone and glass, and thru the sand filter before returning to the storage tanks. Facilities have been arranged for the thorough washing of the sand filters, and the use of but one tank at a time in order to permit the other to settle. All pipes in the system are of insulated iron lined with hard rubber and fitted with hard rubber valves. The general humidity is so regulated that at room temperature the vapor pressure of the moisture in the air is less than that of the sea water in the open aquaria at their low temperature; thus the sea water will not become diluted by acquiring water from the air.

The facilities of the main library of the University are always at the disposal of the workers. However a small working unit of periodicals, books and charts will be maintained in the building library.

The "Catalyst", research boat of the laboratories, is now under construction, scheduled to be commissioned June first of this year. She will be seventy feet long, have an eighteen foot beam, and eight feet ten inches extreme draft. She will have a hundred and twenty horse power full diesel engine designed for an average cruising speed of eight knots and a radius of two thousand miles. Her extra heavy construction was designed for safety at sea, a minimum of vibration, and maximum of stability. She has oak ribs, double planked of Alaska Cedar, sheathed with iron bark at the water line and at the waist, for protection of the hull when apparatus is lowered or hauled aboard during sampling. Comfortable living accommodations are provided for a scientific staff of six, though an additional four may be carried on short trips, and a crew of four.

Rigging booms for sampling and dredging are in the waist of the ship. Just astern is the laboratory, ten by eighteen feet, which is equipped with gas, 110 volt direct and alternating currents, fume hood, built-in tables, sinks and drains for chemical, physical and biological research. Other equipment includes a sonic depth finder with a range down to four hundred fathoms, electric winches holding fifteen thousand feet of quarter inch stainless steel cable for use in hydrography and net hauls, etc., and two thousand feet of half inch steel cable for bottom dredging in shallow water. Sea water is piped around the deck so that dredged material may be kept in good condition until used. While the

ship is under way, water samples may be gathered at a uniform depth near the surface by means of a sea cock in the hull.

Although the "Catalyst" is small, it is entirely seaworthy, and adequate for the present, for in favorable weather work may be done in the open sea and during storms the boat may lie in sheltered water along the island-fringed coast, when research requiring an even keel may be performed.

The field laboratories, the buildings of the former Puget Sound Biological Station, are located on a blunt peninsula on San Juan Island in the San Juan Archipelago, about two miles from the town of Friday Harbor. The tract has approximately four hundred and eighty-four



West View of Friday Harbor Laboratories, U. of Washington Oceanographic

acres of land with upward of two miles of shore line, most of which is exposed country rock, although there are a few scattered gravel beaches in pockets. The land is mostly heavily wooded with a mixed first and second growth conifer forest in which are a few scattered patches of deciduous trees. Quite often there are openings in the forest where the country rock outcrops or comes near the surface.

There are ten buildings, representing an investment of approximately \$100,000. They consist of five laboratories, a library, stockroom, dining and social hall, director's cottage, and curator's cottage. Four of the laboratories are one story structures of concrete and stuccoed tile, with red tile roofs, and each measuring about twenty-four by sixty feet. Each includes a professor's office, a small stockroom with a sink for

miscellaneous equipment and which may be darkened for photographic work, an assistant's room, and a large class room that readily accommodates twenty persons. The fifth laboratory is of the same general structure but is divided into individual research rooms. All laboratories are supplied with running fresh and salt water, and the usual electric outlet for 110 volt alternating current. The chemistry, marine plant physiology, and research laboratories are supplied with gas.

The laboratories skirt the shoreline, facing Friday Harbor across the bay to the south; farther up from the shore are the other structures. Centrally located is the library, a branch of the University library with approximately 3800 volumes of periodicals and reference works, and many charts of the U. S. Coast and Geodetic Survey. The library is maintained solely for reference purposes; thru the courtesy of the University campus library one may obtain nearly any needed volumes on twenty-four hours notice. There is also an inter-library loan service, by which any volume may be made available within a reasonable amount of time.

At the stockroom the common apparatus, glassware and chemicals are obtainable. Ordinary compound and dissecting microscopes of standard make are provided, although it is suggested that investigators supply their own research microscopes. Arrangements for the loan of special pieces of apparatus not available at the stockroom may be made thru members of the staff from their respective departments of the College of Science.

The marine equipment used at Friday Harbor during the summer, other than the "Catalyst" for offshore work, consists of a fifty foot chartered boat equipped with winches, cable, and apparatus for dredging and oceanographic research at any depth in the inshore waters, of twenty odd rowboats, and of a large float with numerous live boxes.

The dining and social hall is a frame structure, thirty-five by eighty-five feet, with a seating capacity of two hundred. On the south side of the room are two alcoves, a huge brick fireplace that warms the hall, and a large front porch; on the north are the attached kitchen, showers and lavatories.

Life at the laboratories is very simple, yet complete and satisfying. A common mess, served family style, is maintained at \$5.75 a week per person. Every one lives in ten by twelve tents having board floors and three foot walls, and providing adequate space for two. The cool nights and occasional showers necessitate plenty of warm bedding and clothing, though the weather is usually invigoratingly warm. Equipment is sup-

plied for those who wish to care for their own laundry; an agency from Friday Harbor also collects laundry weekly.

The field laboratories are open the year round for investigation and each summer the nine week session is held from about the middle of June to the middle of August. A few courses are then offered for graduate students and the occasional exceptional senior, who is admitted to a course only upon obtaining the permission of both his professor and the director. The emphasis here, as it is during the rest of the year, is laid on research, on independent or cooperative problems.



Shore Line at Friday Harbor Laboratories, U. of Washington Oceanographic

To safeguard the perpetuation of the rich fauna and flora of this locality, the state of Washington created a marine biological preserve which includes San Juan County and some adjacent territory. The collection of biological materials by persons not associated with the laboratories is prohibited by law.

Aside from the actual work with the bountiful marine life, the summer session offers an unusual opportunity for the students and young research workers. The additional advantages are mainly those of personal contact and observation, which lead to better comprehension of the problems of fellow workers. These contacts with both physical and biological sciences tend to broaden the viewpoint of each individual. Biologists see the effect of the exact training of the physical scientist and in turn the latter learns to appreciate the complexities that confront the biologist. Association with workers from various institutions over the country likewise leads to mutual understandings and appreciations.

In general the main fields of oceanography, physical, chemical, and biological, are being emphasized at present; in the near future expansion into the geological field is contemplated. In particular the following are a few of the problems under way: Professor T. C. Kincaid is adapting the culture of the Japanese oyster to waters of the Washington coast; Dr. B. S. Henry is studying the marine bacteria of water near Friday Harbor; Drs. L. P. Schultz and J. E. Lynch are working on the fishes of the region; several staff members cooperate to study the bi-weekly variations in chemical, physical, and plankton conditions thruout the year in the sea water at the field laboratories. Last summer hydrographical and hydrobiological sections were taken on a cruise down San Juan Channel thru the Strait of Juan de Fuca to Cape Flattery and return. This summer it is proposed to take similar sections from the Columbia River Bar, from Grays Harbor, and from Cape Flattery, seaward beyond the continental shelf. During the latter part of August and September the staff will make a cruise of exploration thru inshore waters to southeastern Alaska.

Collaboration of the several branches of science in a joint attack upon problems is the keynote of our program. This way lie the surest steps of progress, for the advances in chemistry, physics, and biology are far too rapid and involved for one individual to keep pace with. Furthermore, though physical and chemical oceanography present fields of endeavor complete within themselves, their scientific worth is increased many fold when they are correlated with investigations in oceanic biology. The converse of this statement also holds. Again a maze of factors governing marine environment may appear to the physical oceanographer as purely physical and chemical, when the biologist's angle on the problem usually demonstrates that biological phenomena are likewise in operation, either as causatives or resultants. Correlation of all aspects of our problems will therefore probably lead to more accurate, worthwhile results than if each were studied by itself.

The results of research at either of the laboratories may find facilities for publication in either the "Publications of the University of Washington in Oceanography", which are maintained by the laboratories, or in standard national periodicals representing the various fields of our work. Reprints from these periodicals are collected and bound, forming a second series of articles contributed by the laboratories. In this way the results of all our work is readily available in the library files.

Inquiries for more detailed information concerning the laboratories should be addressed to Dr. Thompson in Seattle.

OBITUARY

ON MARCH 11, 1932, Harvey Monroe Hall, B.S., M.S., Ph.D., died at the age of fifty-eight years. Dr. Hall was born in Lee County, Illinois, March 29, 1874. He received his B.S. at the University of California in 1901, his M.S. in 1902,—and his Ph.D. from the same institution in 1906. During the years of his graduate work he was successively assistant in the herbarium, assistant in the botany course in the university and at the Experiment Station, and later, instructor in botany. After achieving the Ph.D. he became assistant professor, which post he held from 1908 to 1919. In the latter year he became investigator in ecological research for the Carnegie Institution of Washington. He was later made Honorary Curator of the Herbarium of California.

Although interested in the whole field of ecology, he specialized in its experimental phases, in variation and in geographic distribution. His life-work led him to membership in the Botanical Society of America, the Ecological Society, and the American Academy. He was a fellow of the California Academy of Science, and a corresponding member of the Societe Botanique de Geneve.

In 1923 Mu Chapter of PHI SIGMA elected him to membership in our Society.

OUR SCIENTIFIC BRETHREN

ONE of the helpful elements in the scholastic life of our greater colleges and universities is the fine spirit of cooperation between many of the professional fraternities and honorary societies whose purposes extend to, or comprehend, similar fields. With certain of these organizations everyone is familiar. Others, even though national in scope, are so limited in field that only those directly in contact with their members know anything about them. As for the local groups, they are so large in number that acquaintance with their myriad names, types and purposes reaches the domain of the practically impossible.

In the first group, those with which all are acquainted, two types may be mentioned. Of general interest, because it stresses scholarship primarily, is Phi Beta Kappa. It is to the credit of the standards of PHI SIGMA that one so often sees the insignia of both organizations dangling from the same watch chain. (Parenthetically, may we call your attention to an interesting contribution in this issue of THE BIOLOGIST? It is titled "The American Scholar," and every wide awake member of the Society should read it.) Another key quite frequently seen side by side with our own is that of Sigma Xi, possibly because the type of people who "make" PHI SIGMA are the ones that the scientists in Sigma Xi regard as typical representatives of the biological field. Not a few of the female contingent in Phi Sigma are able to greet the wearers of the Sigma Delta Epsilon insignia with that proprietary feeling which comes from membership in the same honorary scientific society.

To our desk has just come the March number of the RECORD published by the Gamma Alpha Graduate Scientific Fraternity. It is an attractive issue, with a cracking good story on life in Porto Rico by a Gamma Alphan who is also a Phi Sigma, Malcolm H. Soule (Beta, '22). There is another article worth reading on pure or mixed forest plantations from the pen of a second member of Beta Chapter of Phi Sigma, Eldred R. Martell, ('24). As we page through this issue of the Record these are not the only familiar names. There is D. S. Welch, (Delta '17), National Recorder, and "Doc" H. G. Hewitt, (Zeta '25), Business Manager of the RECORD. Among the associate editors we detect Don C. Cameron, (Mu '28), George A. Hawkins, (Sigma '26), Newell Norton, (Beta '30), and Harold H. Clum, (Beta '24). Finally, down in the chapter reports we found the name of Lee H. Townsend, (Beta '28), as the presiding genius of the Gamma Alpha House on the Illinois campus.

While the national officers of Gamma Alpha know their own business, we cannot but feel it unfortunate that there are not more chapters of the graduate research fraternity in the larger colleges and universities of the country. Furthermore, we are confident that this same sentiment would find an echo in the opinion of most of the other Phi Sigmas who are also members of Gamma Alpha. The reason is not far to seek. The contacts with men in other fields of science brought about in such organizations as Gamma Alpha cannot be anything but helpful. Perhaps not always in one's own narrow field of research, although even there unsuspected viewpoints are suggested to the best informed, but especially in getting acquainted with the difficulties, problems, methods, successes and opportunities of other men in other fields,—in these is a world of educational possibilities.

HE HAS SAFEGUARDED STUDENT EYESIGHT FOR TWELVE YEARS



—Photo by Rentschler

DR. EMORY W. SINK

THE eyes have it! And what they have when they are the eyes of students of the University is decided by Emory Walter Sink, '11, M.S. '15, '20*m*, Assistant Professor of Hygiene and Public Health, and Ophthalmologist in the Health Service. Dr. Sink started his career as a biologist and was a member of the faculty as Assistant in Zoology, three years before he received his undergraduate degree. But teaching biology and anatomy to medical students aroused in him an interest in their profession. His special field today is Industrial Hygiene. Dr. Sink is a member of many professional and honorary societies and is a charter member and former

National and local President of Phi Sigma, honorary biological fraternity. He is also an active Mason and Past Master of Fraternity Lodge in Ann

Arbor. His wife, Maude Ford Sink, '12, was for many years a teacher in the Ann Arbor High School. Dr. Sink is an out-of-doors enthusiast and spends the summer months in Northern Michigan. He used to be a baseball pitcher but finds golf and "bottle-pool" at the University Club better adapted to a recently enlarged waist-line.

—From *The Michigan Alumnus*, Vol. 38, No. 13, Jan. 9 1932.

THE AMERICAN SCHOLAR

PHI BETA KAPPA, the college honor society, parent of all Greek-letter societies, founded in 1776 at the College of William and Mary in Virginia and now having chapters in one hundred and twenty-six American colleges and a living membership of over 63,000, announces the appearance in January, 1932, of a new quarterly, THE AMERICAN SCHOLAR. This periodical is designed not only for members of Phi Beta Kappa but for all who have general scholarly interests. It is a non-technical journal of intellectual life.

Among its objectives are listed the following:

The promotion in America of liberal scholarship.

A medium for scholars and all persons who are interested in intellectual pursuits, higher learning, and the cultural development of America.

A synthesis of the arts and sciences essential to liberal education and a guiding philosophy of life.

An *esprit de corps* among the educated.

The scholar's responsibility for major social tendencies.

A whole diet for the whole mind.

The contents include articles scholarly but non-technical

by eminent leaders of thought and action at home and abroad; introducing creative minds to the intellectual world; carefully selected from the work of young scholars, even undergraduates; and interpreting literature to non-critics, physics to non-physicists, and economics to non-economists, for example; and education, art, philosophy, and religion not merely to the professionally interested but to the intellectual generally.

THE AMERICAN SCHOLAR will consist of at least 128 seven by ten inch pages, about 100 of which will be general articles and poems

in twelve point old style Caslon type. This will be followed by about twenty-five pages of double column ten point for items of news from the realm of scholarship. The quarterly will be printed by The Scribner Press, edited in the offices of The United Chapters of Phi Beta Kappa, 145 West 55th Street, New York, and distributed at two dollars a year.

The Editor is William Allison Shimer, Ph.D., formerly a professor of philosophy at The Ohio State University; the Consulting Editor, Clark Sutherland Northup, professor of English at Cornell University; and the Editorial Board consists of Ada Louise Comstock, John Erskine, John Huston Finley, Christian Gauss, Will David Howe, Adam Leroy Jones, William Allan Neilson, Harry Allen Overstreet, J. Herman Randall Jr., and Frederick J. E. Woodbridge.

The first number is expected to contain articles by Frank Aydelotte, John W. Davis, John Erskine, John Finley, Dorothy Canfield Fisher, and Owen D. Young, and a poem by Odell Shepard. This journal is a distinct contribution to the intellectual life of America. Every person interested in the American college and the finer elements of American civilization should read *THE AMERICAN SCHOLAR*.

Members of PHI SIGMA will be interested in this periodical. Many of them have already won the Phi Beta Kappa key. Many of them, too, are members of social fraternities. Whether Phi Beta Kappas, fraternity members, or not, they will all read with interest and satisfaction the following clipping from the literature sent out by the Editorial Staff of "*THE AMERICAN SCHOLAR*."

At the Seventeenth National Council of Phi Beta Kappa in session at Brown University on September 11, 1931, adopted unanimously a resolution in which had been incorporated the following statement of Professor George Morey Miller of the University of Idaho, on the encouragement of scholarship by social fraternities.

"I do not know whether this is the appropriate place or not, but I should like to say one word about something in connection with the encouragement of scholarship which I really believe concerns this body.

"A number of people here know, some of you do not, that work undertaken by men like President Tigert and Dr. Shepardson in connection with the work of the social fraternities, especially that undertaken by the Interfraternity Conference in the last few years, has resulted in a marked improvement in the scholarship of college men belonging to social fraternities. It seems to me that it is a matter that concerns this body. I do not know whether we should take any action approving it or not, but I should like at least to see the President and Secretary notify the officers of the Interfraternity Conference that we very much appreciate what they have done.

"Some years ago some of the leaders in the social fraternities became very much ashamed of the magnificent ignorance of college men. It was one of the scandals of college life. The statement was made that the college fraternity was harmful to scholarship—a statement which seemed to be supported by all kinds of proof. In my own fraternity, shortly after the war, I was appointed chairman of a committee to investigate and to see what the situation actually was. Nothing of the kind had ever been done before. They had looked into everything under the sun except scholarship. The committee undertook this work in a cooperative fashion and one of the first things I did as chairman of that committee was to assert that we alone should not get far without complete cooperation from all the prominent national fraternities. My fraternity approved of that, and so I began active correspondence with the president of every important college fraternity. When the committee began its work it was found that in institutions throughout the country having as many as six fraternities in the Interfraternity Conference, fraternity men led in scholarship in only thirty per cent and the non-fraternity men were ahead in over seventy per cent. At the end of five years of the cooperative work and effort on the part of each individual fraternity also, that percentage of institutions in which the fraternity men led in scholarship had risen from thirty to more than fifty.

"These national officers and the boys themselves in the fraternities, with the help, of course, of expert advice from college officers, deans, and members of the faculty, have actually done something that no Phi Beta Kappa group of deans and professors alone could have accomplished, because the fraternities themselves put pressure on the boys to study. Any group of men capable of doing that is doing the work of Phi Beta Kappa. These national officers and men who are working seriously on the problem deserve, I think, our commendation. I do not know what should be done with this report, but I call the attention of this group to that which is a fact and a very important fact."

Mathematics

A straight line is any distance between two places.

* * * * *

Parallel lines are lines that can never meet until they run together.

* * * * *

Things which are equal to each other are equal to anything else.

* * * * *

To find the number of square feet in a room you multiply the room by the number of the feet. The product is the result.

* * * * *

To find the weight of the earth take the length of a degree on a meridian and multiply by $62\frac{1}{2}$ pounds.

* * * * *

A body will go just as far in the first second as the body will go plus the force of gravity and that's equal to twice what the body will go.

—From Mark Twain's *"English as She is Instructed."*

WHEN THE GOOD SHIP "ARK" ALMOST FOUNDERED

THE ark sprang a leak when the storm was the worst,
The monkey observing the accident first,
Inserted his tail in the break in the wood,
Averting the trouble as long as he could.
But cold was the water and cold was the blast,
The monkey was forced to give over at last,
Withdrawing the tail, which young monkeys are told,
Because of his gallantry always is cold.

THE dog to the peril sublimely arose,
Defending the breach with a resolute nose,
'Til even too frigid to bark at a cat,
He sank with frostbitten muzzle, and that
Is why, as all friends of the dog understand,
His nose is so cold on the back of your hand.

THEY aroused Mrs. Noah with cries of alarm,
She plugged up the hole with a lily-white arm;
But cold grew the brine as a logical fact,
Obliging the good skipper's wife to retract,
A limb so enduringly frigid that still
The feminine elbow is pointedly chill.

NOW came Captain Noah; 'twas time that he came,
For big was the aperture, wide was the same;
And bigger and wider and broader it grew,
And Noah sat down where the water surged through.
He sat while his cattleship wallowed and luffed,
Where porpoises gamboled and grampuses puffed.
He sat through the tempest when billows ran high
And navies of icebergs rode glitteringly by.
Through all of the cruise he enduringly sat,
Until the ark grounded on Mount Ararat.
He sat in the wet so you needn't inquire
Why men always stand with their backs to the fire.



AGASSIZ MEMORIAL

*Site of Anderson School of Biology, Penikese Island, Town of Gosnold,
Barnstable County, Massachusetts.*

EDITORIALS

SUMMER SCHOOLS AND STATIONS

The day when the prospective teacher in any biological field, no matter how elementary, could take a series of courses in a college or university with perhaps a smattering of teaching methods, and then go out to fight the world, the devil and the flesh in the shape of Parent Teacher Associations, His Majesty the Student, and a doubly injected frog, is over for good.

Louis Agassiz did it. In this country at least, the lone rock on the top of a lonesome little island off the coast of Massachusetts, has come to mean something very vital, if not essential, to all constructive and productive biological education. The Anderson School of Biology on Penikese has disappeared, but its spirit lives on. As lineal descendant of that first venture under the Father of American Biology, the Marine Biological Laboratory is carrying on under circumstances beyond the wildest dreams of Agassiz, Whitman, Jordan, and the rest of the pioneers who first spent their summers on Penikese.

Great as it has become, magnificent as is its equipment, notable as is the group of scholars it attracts, the Marine Biological Laboratory could never hope to fill the demands for summer training laid upon it. In spite of its steady and successful growth it has had to place stringent restrictions on its enrollment in order to insure the fullest possible return in scientific achievement for the opportunities it offers.

To meet the demand for the type of contacts, instruction and research opportunities offered by the Marine Biological Laboratory a number of other summer stations have come into existence. With a pliancy in organization which was, and is, the secret of the Woods Hole institution's success, these newer stations are to be found in the most different types of locations. Some like the M.B.L. are marine, others are located on fresh water. Some have gone into the depths of primitive forests, while others have located in the open desert, or on mountain slopes. Thus, there is hardly an ecological situation productive of its own peculiar flora or fauna that has not been utilized for the establishment of a summer school or biological station.

This issue of the *BIOLOGIST* presents a galaxy of well known summer biological institutions, each offering its own particular advantages, and each exerting its own peculiar appeal. It is not the place of the *BIOLO-*

GIST to recommend any one in particular. They are presented here in the words of those most familiar with their work. It remains for the members of Phi Sigma to choose the school which most supplies their needs.

In devoting the Spring issue of our quarterly to this service we follow editorial precedent. The Marine Biological Laboratory has been featured on more than one occasion in the past. Last year the BIOLOGIST presented the Rocky Mountain Laboratory at Crested Butte in Colorado, the Lakeside Laboratory at Lake Okoboji in Iowa, and the Mountain Lake Biological Station in Giles County in Virginia. This year we are favored with five more stations, partly inland and partly marine. From the institutions described in the present issue, and from those to which past issues of the BIOLOGIST have been devoted, every interested member of Phi Sigma should be able to choose the station most adapted to his own particular problem.

Mesdemoiselles Et Messieurs les Secretaires:

This issue of the BIOLOGIST goes to press without knocking. IT has not knocked at your doors for more Chapter News. Some of our units were not represented in the March issue because your Editor felt that no good would be accomplished by insisting on the traditional news from the chapters. Nor was it necessary to come to you for assistance in getting the June issue. The response of the biological summer stations was cordial and generous, and the present attractive booklet is the result. It has not been necessary to knock YOU on the character of your contributions this year. Past Editors will look at that March issue and ask: "How did you do it?" And we shall have to shrug our shoulders, because we don't quite understand yet how it happened. The best explanation is that earnest letter from our National Secretary, Dr. Ortenburger. It turned the trick. Let us go on playing the game.

We suspect that there will be less need this Spring for knocking the BIOLOGIST. Unquestionably, it is not all that it might be,—but due attention to controls, and a careful study of the time factor may lead us to look on our experiment with a hopeful attitude. That the day may come when Chapter members will besiege their Secretaries for their latest issue of the BIOLOGIST does not seem such a Utopian dream after all.

After all, there should be no need for knocking. Phi Sigma is not a geological society.

Looking Forward

As this copy of the BIOLOGIST comes to you, fellow member of Phi Sigma, the eventful scholastic year of 1931-1932 will be nearly ended. That it has meant hard sledding for many of you goes without saying. That it has meant difficulties for many Phi Sigma Chapters is also true. Just what, individually or collectively, we might be supposed to have learned from this experience is hard to say now. Later on, when time has given us a better perspective we may find that this year of stress has not been an unmixed evil. Of this much we may be certain, those of us who have weathered the difficulties of this year, no matter what sacrifices they implied, are that much better prepared to face a like, or worse, situation in the future. This is equally true of the Phi Sigma Chapters. Having learned that they can function successfully in spite of adverse conditions they should be that much better able to take advantage of any amelioration the coming year may have to offer. It is to be hoped that this year's members of the Chapters will come back to their colleges and universities next Fall resolved to make 1932-1933 an outstanding year in Phi Sigma history. To do this they will have to get organized early. There is no better time to start laying plans than NOW!

To those members of Phi Sigma who are receiving their advanced degrees this June: Congratulations! May your future scientific careers be as full of successful achievements as your scholastic years. Wherever you go, and however you find yourself placed, do not lose sight of the opportunity which may be at your very door to further the interests of Phi Sigma. Perhaps it is still too soon for you to realize just precisely how much you have been benefited by your membership. No one expects you to see it all at once. Later, no doubt, you will appreciate how much Phi Sigma meant to you, and how much more it might mean to others who have come under your direction. Then, and not until then, will the hour strike for you to do your great service to Phi Sigma. Whether you seize the opportunity for this service or not, that your successful career may some day bring you to such an eminent position, in the scientific world, is our parting hope and felicitation.

DID YOU KNOW THAT . . .

Delta

Clarence Cook Little, '23, is President of the Corporation of the Mount Desert Island Biological Laboratory. An interesting article about this noted institution appears in this issue of the BIOLOGIST.

Beta

H. H. Bartlett, '17, of the University of Michigan, has presented the Field Museum of Natural History with large collections of plants from Guatemala and British Honduras.

Carl O. Erlanson, '23, accompanies Dr. Howard MacMillan to Peru bent on bringing back some disease resistant strains of the wild potato for the Department of Agriculture. A similar collection was made in Mexico last year.

G. R. LaRue, '18, is Director of the University of Michigan Biological Station at Douglas Lake. Among the other responsible factors in this very successful biological summer enterprise we note P. S. Welch, '23; J. H. Ehlers, '18; C. D. LaRue, '20; F. N. Blanchard, '17; F. E. Eggleton, '23; F. C. Gates, '19 and C. W. Creaser, '20. In view of the fact eight out of the fifteen members of the summer station staff are members of PHI SIGMA should make it an attractive spot for study to society members anywhere.

Zeta

James O. Foley, '22, has removed from Tulane Medical and is teaching at the University of Alabama Medical College.

Iota

J. Paul Visscher, '21, is on leave of absence from Western Reserve University to continue his research on barnacles first at Naples, later at the Biological Station at Plymouth.

Carl G. Deuber, '21, has discovered the tomato plant as an indicator for escaping illuminating gas in the greenhouses at Yale. Gas present causes very young shoots to grow more rapidly on the upper surface, causing downward growth.

Kappa

W. T. Heron, '25, is one of a committee of three members of the American Psychological Association on Precautions in Animal Experi-

mentation which is warning the Association of prospective legislation preventing the use of live dogs in any experimental work in the District of Columbia.

Mu

Karl F. Mayer, '24, through his recommendations regarding the spread of psittacosis in California, is responsible for stringent regulations by the State Department of Public Health as to the possession, sale, importation and exportation of love birds and members of the parrot family.

John Thomas Howell, '24, represents the botanical sciences on board the *Zaca*, expeditionship of the California Academy of Sciences, which will cruise among the Revillagigedos and other islands off the coast of Central America and Ecuador. Dr. B. W. Evermann, (Mu,) who is Director of the museum and the Steinhard Aquarium of the Academy, is directly responsible for organizing these cruises.

Robert W. Hodgson, '27, has been honored by the Sultan of Morocco with the title of Officer of the Order of Ouissam Alouite, for his work in furthering citrus growing in Morocco.

Walter Kendrick Fisher, '23, is the Director of the Hopkins Marine Station of Stanford University at Pacific Grove, California. Of the ten members of the staff of this outstanding summer station, four are members of Phi Sigma,—Dr. Fisher, Tage Skogsberg, '23, Harold Mestre, '22, and C. V. Taylor, '22. An interesting and stimulating article about the Hopkins Station by Dr. G. M. Smith, well known to Zeta chapter members, appears in the Special Articles in this issue of THE BIOLOGIST. Members of the Society would do well to consider the opportunities for research offered by institutions like the Hopkins Laboratory in planning their summers.

Omega

Anton J. Carlson, '30, physiologist of Chicago University, conducted the tenth graduate course sponsored by the Toledo Academy of Medicine. Dr. Carlson is also the author of a spirited appeal against the attacks on academic freedom by Premier Mussolini in Italy, which appeared in a recent issue of SCIENCE.

HONORS, GRANTS, ELECTIONS AND APPOINTMENTS

Delta

Dr. P. W. Whiting, '25, has been elected Secretary-Treasurer of The Genetics Society of America, a new organization formed at the New Orleans meetings of The American Society of Zoologists and the Botanical Society of America. Dr. Whiting urges all who are professionally interested in Genetics to contact him with a view to securing membership in the new society, which will have charge of the joint sections formerly devoted to genetics at the winter meetings.

Epsilon

F. H. H. Roberts, '23, has been ordered by the Bureau of American Ethnology to serve as consulting archaeologist at the explorations of Chichen Itza with the Carnegie Institution of Washington.

R. G. Gustavson, '25, has been appointed to take charge of registrations for the April 25-28 meetings of the Southwestern Division of the American Association for the Advancement of Science.

Zeta

L. J. Cole, '25, as past chairman of one of the former sections of the genetics groups at the A.A.A.S. meetings, is serving on the executive committee of the new Genetics Society of America.

Kappa

E. A. Smith, '20, has received a grant from the Committee on Scientific Research of the American Medical Association for the study of the effects of certain gases on animal bodies.

Mu

T. D. Beekwith, '23, will act as secretary for the section at the meetings of the Pacific Coast Division of the A.A.A.S. to be sponsored by the Society for Experimental Biology and Medicine. The meetings will be held at the State College of Washington, June 15-18.

Emanuel Fritz, '28, has been reappointed editor-in-chief of the JOURNAL OF FORESTRY.

Alpha Epsilon

J. T. Gamble, '29, is taking the place of S. H. Williams, '29, at the University of Pittsburgh Lake Laboratory during the coming summer. Dr. Williams has been appointed to the Pennsylvania State Game Commission.

Alpha Theta

F. DeF. Heald, '30, will preside at the sessions of the Pacific Section of the Botanical Society of America at the State College of Washington meetings of the A.A.A.S. this summer.

HAVE YOU READ . . .*Beta*

Mineralogie en de bodem, by Maurits W. Sensius, '19. LAND-BOUWKUNDIG TYDSCHRIFT, (Wageningen, Nederlands,) Vol. 44, 19-28, 1932.

Delta

Polydactylism in Mice, by J. J. Murray, '24. SCIENCE, Vol. 75, No. 1942, March 18, 1932, p. 312.

Iota

How Big is a Cell? by Edgar Anderson, '22. SCIENCE, Vol. 75, No. 1944, April 1, 1932, p. 359.

Size of Infection as an Influence on the Persistence of Adult Trichinae in Rats, by R. R. McCoy, '25. SCIENCE, Vol. 75, No. 1944, April 1, 1932, p. 364.

The Filtration of Bacteria, by A. I. Kendall, '27. SCIENCE, Vol. 75, No. 1942, March 18, 1932, p. 295.

Mu

Uninvited Guests, by David Causey, '25. "Probably the most witty, interesting, and yet accurate account of human parasites that has ever been offered to the general reader,"—Dr. Edwin Grant Conklin, Princeton. 144 pp., 44 ill., \$2.00, at all bookshops. Alfred A. Knopf, Publisher, New York.

Rho

Invertebrate Zoology, by Harley Jones Van Cleave, '25. This second edition has been completely rewritten and reorganized to incorporate the most recent discoveries of research workers, 282 pp., illustrated, \$3.00. McGraw-Hill Book Co., N. Y.

The Influence of Temperature and Breeding upon the Rate of Growth of Chick Embryos, by E. W. Henderson, '28. Research Bull., No. 149, Missouri Agricultural Experiment Station, 1930.

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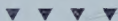
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